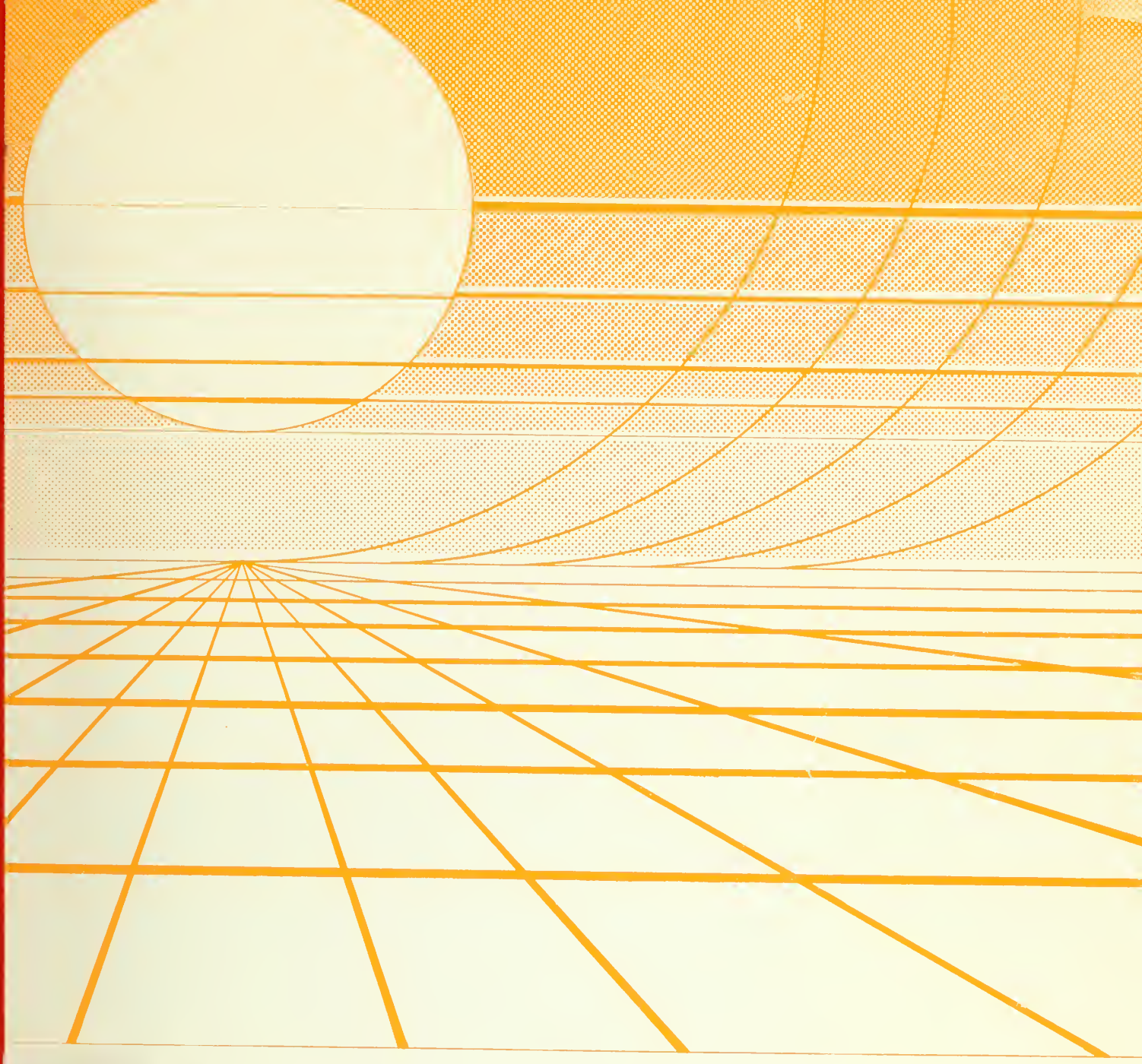

CULUM 1980

INTERIM)

MATHEMATICS 10 & 13

Alberta
EDUCATION

MATHEMATICS 10 AND 13
INTERIM CURRICULUM GUIDE

PLEASE NOTE:

This curriculum guide is interim in nature. The guidelines presented in this curriculum guide will be subject to revision according to information received from schools during the school years 1980-81 and 1981-82.

A comprehensive curriculum guide and resource guide will be produced when the complete senior high school mathematics program is completed.

The complete program will be implemented as follows:

	OPTIONAL	MANDATORY
Math 10, 13	September, 1980	September, 1981
Math 20, 23	September, 1981	September, 1982
Math 30, 33	September, 1982	September, 1983

ACKNOWLEDGEMENT

Alberta Education acknowledges with appreciation the contribution of the following members of the Committee on Senior High School Mathematics operating under the direction of the Mathematics Coordinating Committee and the Curriculum Policies Board.

COMMITTEE ON SENIOR HIGH MATHEMATICS

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Alberta Education also acknowledges the valuable contribution of many senior high school teachers throughout the province in providing assistance in the development of the program.

Special thanks to Darlene Barnard for many hours of typing and assistance in production.

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ORIENTATION TO THE PROGRAM

A. STRUCTURE

Core

A common set of mathematics objectives has been identified as basic to both the Mathematics 10 and Mathematics 13 course. The topics of this core program are a continuation of those presented in the junior high mathematics program, except for the introduction of some new subject matter.

Trigonometry and Statistics are new to the Grade 10 program. These topics are developed as complete strands through the three high school grades.

> *It should be noted that even though some of the objectives are similar for the two courses the methods of instruction and the time required for topics will not be the same. An experimental approach with more time being devoted to basic skills is suggested for the Mathematics 13 program.*

Independent Core

While common objectives of topics have been identified as a core, each course has a separate set of objectives specific to the course. These objectives are listed under the title of independent core.

The Mathematics 10 independent core goes further into the theoretical development of mathematics concepts with a greater emphasis on formalization.

The model of instruction suggested for the Mathematics 13 independent core would be based on an experimental approach with an increase in time spent on exploratory activities.

Electives

Elective topics in the senior high school mathematics program have been included only at the Grade 11 and 12 levels. The grade 10 program does not have an elective component to ensure sufficient time for an adequate mathematical foundation for subsequent courses.

B. AREAS OF EMPHASIS

Course Content

A deliberate attempt has been made to reduce course content with possible gains in the form of learning by discovery. The number of concepts and the depth of coverage has been reduced in an attempt to provide time for teachers and students to pursue different interesting ideas.

Problem-Solving

A deliberate attempt has been made to stress problem-solving. This is a crucial aspect of mathematical activity and as such should demand a great deal of effort, activity and planning on the part of teachers and students.

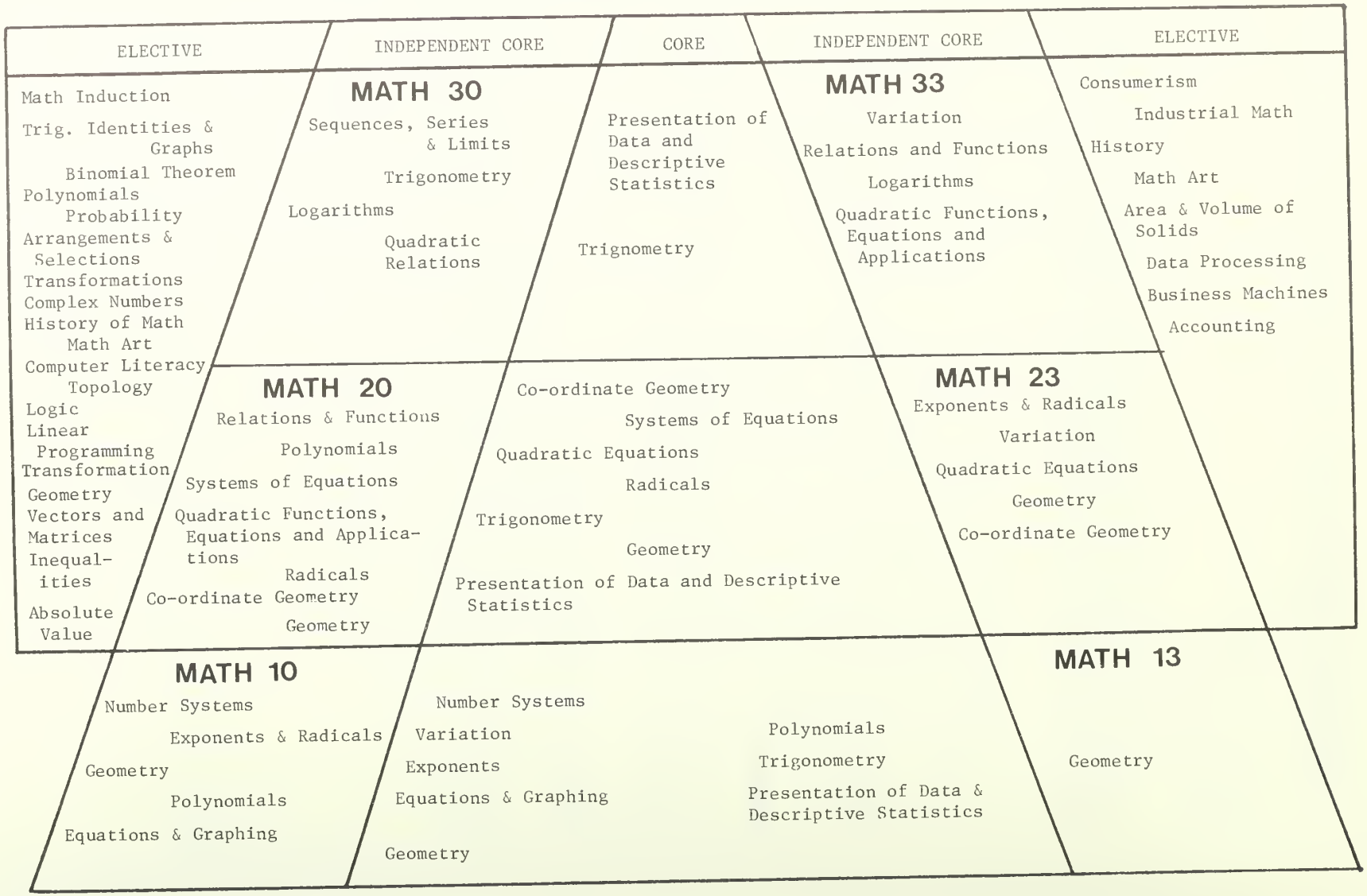
Application

A deliberate attempt has been made to relate mathematics to real life situations with a view to making the study of mathematics more meaningful to the vast majority of students.

Resource Material

A section of comments and possible applications has been prepared to give some suggestions to teachers. This section will be greatly improved as more ideas are supplied by teachers. A comprehensive resource guide including references, materials, films and other aids will be produced as the complete high school program is developed.

MATHEMATICS PROGRAM OVERVIEW



SUGGESTED TIME ALLOCATIONS

Math 10

Topic	Number of Hours
A. Number Systems	12
B. Equations and Graphing	12
C. Presentation of Data and Descriptive Statistics	12
D. Variation	7
E. Exponents and Radicals	20
F. Polynomials	25
G. Trigonometry	12
H. Geometry	25
	125

Math 13

Topic	Number of Hours
A. Number Systems	10
B. Equations and Graphing	20
C. Presentation of Data and Descriptive Statistics	12
D. Variation	12
E. Exponents and Radicals	15
F. Polynomials	24
G. Trigonometry	12
H. Geometry	20
	125

Note: These time allocations include review and evaluation. The difference in time allocated to each topic in the Mathematics 10 and 13 courses is an indication of difference in the courses.

TEXTS AND REFERENCES

Primary Resources:

Math 10:

Bye, M. P., Griffiths, T. J. and Hanwell, A. P., *Holt Math 4*, Toronto: Holt, Rinehart & Winston, 1980.

or

Ebos, F. and Tuck, B., *Math Is 4*, Don Mills: Thomas Nelson & Sons (Canada) Limited, 1979.

Math 13:

Carli, E. G., Egsgard, J. C., Psica, C. and Del Grande, J. J., *Mathematics For A Modern World: Book 2*, Toronto: Gage Educational Publishing Ltd., 1975.

or

Dottori, D. McVean, R., Knill, G. and Seymour, J., *Applied Mathematics For Today: Introduction*, Toronto: McGraw-Hill Ryerson Ltd., 1980.

Recommended Resource:

Math 10:

Dottori, D., McVean, R., Knill, G. and Seymour, J., *Foundations of Mathematics For Tomorrow: Introduction*, Toronto: McGraw-Hill Ryerson Ltd., 1974

GOALS OF THE SENIOR HIGH SCHOOL MATHEMATICS PROGRAM

Although the different courses of the senior high school mathematics program have different specific objectives, the goals of the senior high mathematics program are set forth in relation to three main expectations and needs: those of the individual, those of the discipline of mathematics and those of society at large. They are listed as follows:

Student Development

a) To develop in each student a positive attitude towards mathematics.

b) To develop an appreciation of the contribution of mathematics to the progress of civilization.

c) To develop the ability to utilize mathematical concepts, skills and processes.

d) To develop the powers of logical analysis and inquiry.

e) To develop an ability to communicate mathematical ideas clearly and correctly to others.

Discipline of Mathematics

a) To provide an understanding that mathematics is a language using carefully defined terms and concise symbolic representations.

b) To provide an understanding of the concepts, skills and processes of mathematics.

c) To provide an understanding of the common unifying structure in mathematics.

d) To furnish a mode of reasoning and problem solving with a capability of using mathematics and mathematical reasoning in practical situations.

Societal Needs

a) To develop a mathematical competence in students in order to function as citizens in today's society.

b) To develop an appreciation of the importance and relevance of mathematics as part of the cultural heritage that assists people to utilize relationships that influence their environment.

c) To develop an appreciation of the role of mathematics in man's total environment.

PROBLEM SOLVING

The discipline of Mathematics provides one of the best opportunities to practise the process of problem solving. The techniques learned and experience gained are transferable to almost any problem solving situation and provide the basis of successful living.

Everyone's job involves problem solving. Although many of the problems we have to contend with are repetitious and are easily resolved once the initial solution is known, the most challenging and exciting aspects deal with problems that are completely new to the individual or arriving at solutions in new and creative ways.

A primary purpose of education is to provide a student with the tools to solve a wide variety of problems. Specific problem solving skills can be taught; however, the method of successfully tackling untried problems is not always fully understood. There is a sequence of steps by which one can proceed, such as:

a. fully understanding the problem

b. accepting the challenge of searching for a solution

c. making a reasonable guess at the answer (this provides a check when a solution is finally found)

d. pictorially or graphically representing the important aspects of the problem if this is at all possible

e. solving a simpler version of the problem or a special case of the more general problem

f. using specific cases to discover patterns or different approaches to the problem

g. solving the general problem

h. checking the solution in the special cases solved before. (Does the solution seem reasonable based on your initial guess?)

The above sequence of steps is helpful in tackling any problem. Considerable intuition and experience are still necessary to tackle the really difficult problems.

APPLICATIONS

A central and encompassing approach to making the study of mathematics both meaningful and interesting is to place a major emphasis in the area of applications. An application is the process of using a mathematical skill to arrive at a solution to a real life or practical situation. Applications should incorporate interesting, useful, relevant and diverse examples from real life situations. The significance of using applications is based on relating mathematical concepts and skills to problems encountered in society and the environment. Mathematics may be related to countless aspects of living. Our task is to have students recognize these relations, develop an understanding of the interrelationships that exist with a mathematics program and then learn to transfer their present use of mathematics to other situations.

Applications, like problem solving, should be integrated into the overall program rather than dealt with as an independent unit. Whenever possible, integration and coordination with other subject areas is important. When applications require extensive computations, the use of the calculator may become a necessary component of the learning process to avoid time-consuming calculations.

STATISTICS

Statistics is an exciting new addition to the mathematics curriculum. It provides many opportunities for applications and hence is easily motivating.

Statistics, over the past number of years, has played an increasing role in public information. We are continually bombarded by statistical information, such as Consumer Price Index, baseball averages, weather forecasting, election polls and stock market indices.

Statistics is being used extensively in research and industry. In any enterprise where large amounts of data need to be handled and processed, where predictions are to be made, statistical methods play a role. Statistical techniques are also used in designing telephone exchanges, optimally setting traffic lights, designing insurance policies, determining the reliability of one's car, criminal detection, and market research, to mention a few.

The introduction of statistics at this level is intended to familiarize the student with the elementary descriptive measures that form the basis of any further work with large data sets. In most cases the data should be collected by the student, preferably different data for each student. This could be a stimulating project. The subsequent analysis then becomes more meaningful and hopefully provides not only statistical insight, but some new knowledge about our surroundings. In order to understand and intelligently discuss much of the information to which we are daily subjected, some knowledge of the terminology and underlying assumptions of statistics is necessary.

Statistics is an applied science. To motivate this subject, especially at the introductory level, one should concentrate on the experimental approach. This unit provides the opportunity for field trips to collect data. By displaying this data in various forms via graphs, one can make some basic inferences about the data source. To justify the collection of the data, it is important to make some inference. Just as important is to ask what further information would be worth knowing and discuss how one would proceed to discover it.

MATHEMATICS 10 AND 13 COURSE OBJECTIVES

COURSE OBJECTIVES FOR MATHEMATICS 10 AND 13

A. NUMBER SYSTEMS

MATH 10	MATH 13	COMMON CORE	
			1. Identify numbers as natural, whole, integral and rational.
			2. Add, subtract, multiply and divide rational numbers.
			3. Convert a rational number from decimal form to fractional form $\frac{a}{b}$ and vice versa.
			4. Apply percentage to consumer-related problems: a) simple interest b) discounts and mark-ups c) commissions
			5. Apply percentage to the calculation of compound interest.
			6. Identify irrationals as: a) infinite repeating decimals b) terminating decimals
			7. Identify irrationals as: a) infinite non-repeating decimals b) square roots of numbers which are not perfect squares c) special cases such as ¶
			8. Represent the relation between natural numbers, whole numbers, integers, rationals, irrationals and reals by a pictorial diagram.

B. EQUATIONS AND GRAPHING

MATH 10	MATH 13	COMMON CORE	
			1. Maintain skills in solving first degree equations with rational coefficients.
			2. Solve word problems whose solutions are based on first degree equations with rational coefficients.
			3. Identify and use the terms: quadrant, origin, axis, coordinate, ordered pair, abscissa and ordinate.
			4. Recognize and graph ordered pairs.
			5. Maintain skills of graphing: a) one variable first degree equations b) two variable first degree equations
			6. Apply the skills of graphing two variable first degree equations to practical problems.

C. PRESENTATION OF DATA AND DESCRIPTIVE STATISTICS

			1. Organize data by: a) collecting various types of data b) grouping data into classes c) determining the frequency of each class d) defining class width (interval), class boundaries and class marks e) graphing data
			2. Calculate the mean, median and mode for given data.

C. PRESENTATION OF DATA AND DESCRIPTIVE STATISTICS (Cont.)

MATH 10	MATH 13	COMMON CORE	
			3. Select the most suitable of the three types of averages for a given set of data.
			4. Define the following terms: raw data, sample, population and measures of central tendency.
			D. VARIATION
			1. Identify direct variation.
			2. Identify inverse variation.
			3. Identify partial variation.
			4. Solve problems based on direct, inverse and partial variation.
			5. Find the constant of proportionality for a given variation.
			E. EXPONENTS AND RADICALS
			1. Utilize the following laws of exponents: Where $a, b \in I$; $x, y \in R$; $x \neq 0, y \neq 0$ $x^a \cdot x^b = x^{a+b}$ $x^a \div x^b = x^{a-b}$ $(x^a)^b = x^{ab}$ $(xy)^a = x^a y^a$

(Cont.)

E. EXPONENTS AND RADICALS (Cont.)

MATH 10	MATH 13	COMMON CORE	
			$\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$ $x^o = 1$ $x^{-a} = \frac{1}{x^a}$
			2. Change a number from decimal form to scientific (standard) notation and vice versa.
			3. Perform the operations of multiplication and division on numerals expressed in scientific notation.
			4. Use the laws of exponents, where $a, b = \frac{1}{2}, \frac{1}{3}$.
			5. Utilize the terms radical, radicand and radical sign when $a \in Q$.
			6. Utilize the definition $x^{\frac{a}{b}} = \sqrt[b]{x^a} = \left(\sqrt[b]{x}\right)^a$ where $b = 2, 3$; $x \in R$.
			F. POLYNOMIALS
			1. Know and be able to use the following terms: a) algebraic expression b) term c) factor d) monomial e) binomial (Cont.)

F. POLYNOMIALS (Cont.)

MATH 10	MATH 13	COMMON CORE	
			f) trinomial g) polynomial h) coefficient i) degree
			2. Evaluate a polynomial for given values of the variables.
			3. Add and subtract polynomials.
			4. Multiply: a) monomial x monomial b) monomial x binomial c) monomial x trinomial d) binomial x binomial
			5. Write the expansions of $(P + Q)^2$, $(P - Q)^2$ and $(P - Q)(P + Q)$ and recognize them as general cases.
			6. Recognize and factor a polynomial with a common factor where the common factor may be: a) a monomial b) a binomial
			7. Factor a trinomial of the form $ax^2 + bx + c$; a, b, c, $\in$ I.
			8. Factor polynomials of the form $P^2 - Q^2$.
			9. Factor polynomials by using any combination of the methods outlined in objectives 6 through 8.

F. POLYNOMIALS (Cont.)

MATH 10	MATH 13	COMMON CORE	
			10. Divide a polynomial by a: a) monomial b) binomial
			11. Simplify rational expressions by factoring.
			12. Perform the operations of multiplication and division with rational expressions.
			13. Perform the operations of addition and subtraction of rational expressions with: a) the same denominators b) different denominators
			14. Determine permissible and non-permissible values of the variables in rational expressions.
			15. Determine the zeros of a polynomial of one variable by factoring.
			16. Solve equations involving rational expressions.
			G. TRIGONOMETRY
			1. Find the unknown sides in similar triangles.
			2. Apply similar triangles to practical problems.
			3. Define sine, cosine and tangent ratios for right-angle triangles.

G. TRIGONOMETRY (Cont.)

MATH 10	MATH 13	COMMON CORE	
			4. Find the trigonometric ratios of acute angles in the right triangle when the sides are given.
			5. Determine the trigonometric ratios for a given acute angle.
			6. Determine the measure of any acute angle, given one of its trigonometric ratios.
			7. Solve problems based on right triangles using trigonometric ratios.
			H. GEOMETRY
			1. Recognize and use the following terms: vertex, side(ray), degree, straight angle, right angle, acute angle, obtuse angle, reflex angle, adjacent angles, complementary angles and supplementary angles.
			2. Recognize and use the following terms associated with triangles: equilateral, equiangular, isosceles, scalene and right triangles.
			3. Use the Pythagoras Theorem to solve right triangles and associated problems.
			4. Recognize and use the following terms associated with polygons: quadrilateral, trapezoid, parallelogram, rectangle, rhombus, square, regular polygon and diagonal.

H. GEOMETRY (Cont.)

MATH 10	MATH 13	COMMON CORE	
			5. Recognize and use the following terms associated with parallel lines: transversal, corresponding angles, alternate angles and interior angles.
			6. Recognize and use the following terms: congruency, similarity, perpendicular, bisector and perpendicular bisector.
			7. Measure an angle with a protractor.
			8. Construct an angle congruent to a given angle.
			9. Construct the bisector of a given angle.
			10. Construct a perpendicular to a given line segment: a) at a given point on a segment b) through a point not on the same segment
			11. Construct the right bisector of a line segment.
			12. Construct a line parallel to a given line.
			13. Recognize that a formal, axiomatic development requires: a) undefined terms b) definitions c) assumptions (postulates or axioms) d) theorems

H. GEOMETRY (Cont.)

MATH 10	MATH 13	COMMON CORE	
■			14. State, prove and apply these basic theorems of geometry: a) vertically opposite angle theorem b) congruences of triangles using SAS, ASA SSS c) isosceles triangle theorem d) parallel line theorems e) the sum of the measures of the interior angles of a triangle is 180^{o}.
■			15. Apply the basic theorems to solve problems involving numerical applications.
	■		16. Solve problems related to vertically opposite angles.
	■		17. State and apply conditions for congruence of triangles - SAS, SSS, ASA.
	■		18. State the conditions for similarity and solve related problems.
	■		19. State the conditions for parallelism and apply to solving related problems.
	■		20. State and apply area formulas for triangles, rectangles, squares, parallelograms and trapezoids.
	■		21. Solve problems involving numerical applications of the relationships and conditions described in objectives 16 to 20.

MATHEMATICS 10
PRIMARY
REFERENCE
CORRELATION

MATHEMATICS 10 - PRIMARY REFERENCE CORRELATION

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES *Math Is 4*	PRIMARY REFERENCES *Holt Math 4*
A. Number Systems				
1. Identify numbers as natural, whole, integral and rational.	Although students entering high school mathematics should have a good knowledge of how the various number systems are related, a variety of mathematics activities which will review and maintain previously developed basic skills will be necessary.		10-17	4-7
2. Add, subtract, multiply and divide rational numbers.				4-5
3. Convert a rational number from decimal form to fraction form $\frac{a}{b}$ and vice versa.			14-17	21-23
4. Apply percentage to consumer related problems: a) simple interest b) discounts and mark-ups c) commissions.			100, 101, 68	24, 25, 182, 185, 191, 199, 386, 393, 395
5. Apply percentage to the calculation of compound interest.	Students should become aware of the difference in interest earned using simple interest or compound interest and be aware of different compounding periods. The calculator can be used in this section.	Calculate the interest earned on an investment of $400.00 for 5 years if interest is compounded semi-annually or monthly.		24, 25, 386, 393
6. Identify rationals as: a) infinite repeating decimals b) terminating decimals			14-17	21-23, 31

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES	
			Math Is 4	*Holt Math 4*
A. Number Systems (Cont.) 7. Identify irrationals as: a) infinite non-repeating decimals b) square roots of numbers which are not perfect squares c) special cases such as ¶	Show the density of irrationals on a number line.		46, 47	31-34
8. Represent the relation between natural numbers, whole numbers, integers, rationals, irrationals and reals by a pictorial diagram.	The relationship may be demonstrated using a Venn diagram, tree diagram or flow chart.		50	6-7
B. Equations and Graphing 1. Maintain skills in solving first degree equations with rational coefficients.	Equations with variables in denominator will be covered in section F 16.		69-77	39-42
2. Solve word problems whose solutions are based on first degree equations with rational coefficients.	Several practical problems exist in the sciences, business and technical fields that require the development of equations and their respective algebraic and graphical solutions.		78-86, 97	177-185
3. Identify and use the terms: quadrant, origin, axis, coordinate, ordered pair, abscissa and ordinate.		Latitude and longitude; grid plans of cities and laying out of new townsites; telephone rates are based on a grid system; grid organization of an oil-field.	102-106	115-118

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES *Math Is 4*	PRIMARY REFERENCES *Holt Math 4*
B. Equations and Graphing (Cont.) 4. Recognize and graph ordered pairs	Game approaches, such as "Battleship" and picture plotting, can be used to reinforce graphing concepts. Computer games often involve grids and the plotting of points.		103-106	116-118
5. Maintain skills of graphing: a) one variable first degree equations b) two variable first degree equations	Have the students make up relations to be graphed. Graphing should be restricted to the use of a table of ordered pairs.	The toll for crossing a bridge is a dollar for the car and driver plus 50 cents for each passenger. Graph this relation.	106, 113-116, 177, 178	126-127
6. Apply the skill of graphing two variable first degree equations to practical problems.		Graph some of the common science formulas such as $C = \frac{5}{9}(F - 32)$ and $d = 30t$.	107, 108, 116, 117, 192, 193	201-205
C. Presentation of Data and Descriptive Statistics 1. Organize data by: a) collecting various types of data b) grouping data into classes c) determining frequency of each class d) defining class width (interval), class boundaries, and class marks e) graphing data	As an extension to the graphing work previously done, students should be able to collect and organize data so that proper decisions, inferences, and predictions can be made. A thorough knowledge of the basic concepts of statistics will stimulate problem solving. The types of graphs used should include bar graphs, circle graphs and histograms.	Statistical applications involving the students themselves are plentiful. The heights of students in the class, for example, measured to the nearest cm, can be plotted in a histogram. Ideally, at least 100 data items produce a presentable histogram, so the data from a number of classes of students of the same age may be pooled. This histogram may be bimodal due to the fact that	378-380	319-321 321-324 322 332 324-330

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES: *Math Is 4*	PRIMARY REFERENCES: *Holt Math 4*
C. Presentation of Data and Descriptive Statistics (Cont.)				
2. Calculate the mean, median and mode for given data.	To assist in introducing the concepts required in grouped data is to write each piece of data on a separate slip of paper. If you now have a number of boxes, one for each class interval, have the students deposit the data slips in the appropriate boxes. By counting the data slips in each box you now have the class frequencies. This exercise will make the ideas of class width with class boundaries self-evident. (Class widths should all be the same.) Extending these concepts of grouped data can be done in the following way: Take one of the boxes containing data slips and tell the students the frequency of that class. (It is instructive to label each box with the class boundaries, and after the slips have been deposited, with the class frequency.) Have the student guess the mean of the numbers in the box. After some discussion and experimentation, the students will probably agree that the class mark represents the best guess at the mean of the data in any box. This assumes one is not allowed to examine the individual numbers in the boxes.	males and females are grouped together. This bimodality illustrates the fact that we do not have a homogeneous group. By drawing two histograms, one for females and one for males, one most likely obtains a reasonable approximation to the normal curve. In the example of student heights, the mean is the most suitable average. In data where there are very few or very large values, these tend to distort the mean and hence the median is the most suitable measure of the average. Some personal income examples fall in to this category. In grouped data, the class with the highest frequency is called the modal class and the class mark is called the mode. This is especially useful in commerce. If you have a histogram of feet sizes of Albertans, grouped in such a way that each class represents a standard shoe size, then the modal class represents the shoe size most often purchased. Beware the merchant who does not use statistics in ordering his stock of shoes. (Cont.)	380-382	330-339 330-333

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES *Math Is 4*	PRIMARY REFERENCES *Holt Math 4*
C. Presentation of Data and Descriptive Statistics (Cont.)		Other examples of data that can be handled similarly are: a) the odometer on the student's/ parents' car b) the area of a student's home c) the number of pushups a student can do. Here is an opportunity for student participation. A small project for each student could be constructing and analyzing a histogram on data of their own choosing. The most interesting data and presentations could be collected to provide resource materials for the teacher over the years.		
4. Define the following terms: raw data, sample, population and measures of central tendency.			375-377	317-319, 330
D. Variation 1. Identify direct variation.	Illustrate graphically the different types of variation.		323-325	140-143
2. Identify inverse variation.			326-328	147

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES *Math Is 4*	PRIMARY REFERENCES *Holt Math 4*
D. Variation (Cont.) 3. Identify partial variation.			328, 329	144-146
4. Solve problems based on direct, inverse and partial variation.	Have the students develop practical problems that are familiar to them such as wage earnings, consumer problems and science problems.		325, 327-329	140-147
5. Find the constant of proportionality for a given variation.	Additional explanations may be required if the problems encountered involve variables other than the first degree.		323-327	140-147
E. Exponents and Radicals 1. Utilize the following laws of exponents: Where a, b, ε I; x, y, ε R; $x \neq 0$, $y \neq 0$ $x^a \cdot x^b = x^{a+b}$ $x^a \div x^b = x^{a-b}$ $(x^a)^b = x^{ab}$ $(xy)^a = x^a y^a$ $\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$	Initially, the values of "a" and "b" should be specific integers while the values of x and y should be either specific numbers or variables. Students should be able to recognize the parts of a power from an example. e.g., x^3: x^3 is the power x is the base 3 is the exponent Every attempt should be made to help students understand the reasons why these laws exist. Demonstrate that: $(2^2) \cdot (2^3) = (2 \cdot 2) \cdot (2 \cdot 2 \cdot 2) = 2^5$		20-24, 60-63, 64	10, 11 12 11 14 14

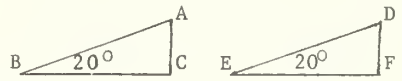
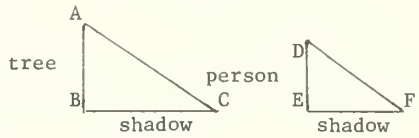
OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES *Math Is 4*	PRIMARY REFERENCES *Holt Math 4*
E. Exponents and Radicals (Cont.) $x^0 = 1$ $x^{-a} = \frac{1}{x^a}$	and then short cut to the law $2^2 \cdot 2^3 = 2^{2+3} = 2^5$			13 13
2. Transform a number in decimal form to scientific (standard) notation and vice-versa.			64	19-20
3. Perform the operations of multiplication and division on numbers expressed in scientific (standard) notation.			64	19-20
4. Use the laws of exponents, where a,b = 1/2, 1/3	The values of "a" and "b" are extended to rational values as a means of relating rational exponents to radicals to show relationship between radicals and powers. Demonstrate: $\sqrt{2} \cdot \sqrt{2} = 2$ and $2^{\frac{1}{2}} \cdot 2^{\frac{1}{2}} = 2$ $2^{\frac{1}{2}}$ must equal $\sqrt{2}$		61, 62	104-107

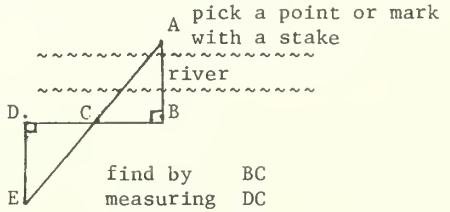
OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES *Math Is 4*	PRIMARY REFERENCES *Holt Math 4*
E. Exponents and Radicals (Cont.) 5. Identify and use the terms radical, radicand and radical sign when a ∈ Q.	Students should be able to identify each part of a radical expression from a given example. e.g., $\sqrt[3]{x^4}$: $\sqrt[3]{}$ is the radical sign 3 is the index x^4 is the radicand x^4 is the radical		33	31-39
6. Utilize the definition $x^{\frac{a}{b}} = \sqrt[b]{x^a} = \left(\sqrt[b]{x}\right)^a$ where b = 2, 3, x ∈ R	Multiplication of exponential expressions of the type below should be avoided: $\frac{\sqrt[3]{x^5} \quad \sqrt[4]{x^3} \quad \sqrt{4x^2}}{\sqrt[7]{x^5} \quad \sqrt{x^7}}$		60-63	104
F. Polynomials 1. Know and be able to use the following terms: a) algebraic expression b) term c) factor d) monomial e) binomial f) trinomial g) polynomial Cont.	Like and unlike terms should be clearly explained. Considerable time should be spent here on the language of mathematics. Order of operations should also be reviewed. Stress the difference between term and factor.		18, 43, 24, 230-233	49-51

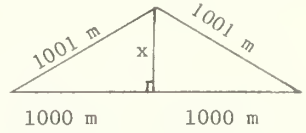
OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES *Math Is 4*	PRIMARY REFERENCES *Holt Math 4*
F. Polynomials (Cont.) h) coefficient i) degree				
2. Evaluate a polynomial for given values of the variables.		Substitute values for the variables in some of the more common formulae used in science such as area, volume and measurement. This can be related to area and volume of hot dogs, hamburgers, pistons and other items.	65	52-54
3. Add and subtract polynomials.			18-20	55-57
4. Multiply: a) monomial x monomial b) monomial x binomial c) monomial x trinomial d) binomial x binomial	Numerical examples [(6 + 2) (6 - 2)] can be used to introduce algebraic multiplication of (x + 2) (x - 2).		24-28, 43-45, 231	57-63
5. Write the expansions of: $(P + Q)^2$, $(P - Q)^2$ and $(P - Q) \cdot (P + Q)$ and recognize them as general cases.	Diagrammatic illustrations of $(p + q)^2$ can be presented. p + q p: p^2 | pq + q: pq | q^2	Show the biological implications in heredity such as a pea having a dominant wrinkled gene (W) and a recessive smooth gene (w) crossed with same (W + w). $(W + w)\ (W + w) = W^2 + 2Ww + w^2$ W^2: Dominant wrinkled pea $2Ww$: two heterogeneous wrinkled peas w^2: recessive smooth pea	240-241	63-65

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES	
			Math Is 4	*Holt Math 4*
F. Polynomials (Cont.) 6. Recognize and factor a polynomial with a common factor where the common factor may be: a) a monomial b) a binomial			230-233	71-73, 74-75
7. Factor a trinomial of the form: $ax^2 + bx + c$: $a, b, c, \varepsilon I$.			233-237	78-83
8. Factor polynomials of the form: $p^2 - Q^2$	Have students experiment inductively with questions of this type before teaching a specific method of factoring.		240-242	75-76
9. Factor polynomials by using any combination of the methods outlined in objectives 6 through 8.		Introduce problems requiring factoring. Example: A quadrilateral which has a length of 2 metres longer than its width is to have its area increased by one square metre. What are the dimensions of the new quadrilateral?	243	84-87
10. Divide a polynomial by a: a) monomial b) binomial			24-28, 235	66-70

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES *Math Is 4*	PRIMARY REFERENCES *Holt Math 4*
F. Polynomials (Cont.)				
11. Simplify rational expressions by factoring.	Review numerical rational number operations before proceeding with the rational algebraic number operations. Include rational expressions of the form: $\frac{a - b}{b - a}$		235, 237 244, 245	92-94
12. Perform the operation of multiplication and division with rational expressions.			244, 245, 253	95-98
13. Perform the operations of addition and subtraction of rational expression with: a) the same denominator b) different denominators			246-248	98-101
14. Determine permissible and non-permissible values of the variables in rational expressions.			235, 244, 246	90-92
15. Determine the zeros of a polynomial of one variable by factoring.			237-239	85-86

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES *Math Is 4*	PRIMARY REFERENCES *Holt Math 4*
F. Polynomials (Cont.) 16. Solve equations involving rational expressions.			248-250	185, 199
G. Trigonometry 1. Find the unknown sides in similar triangles.	It is worth introducing trigonometry by using similar triangles since this gives students practice in thinking in terms of ratios of sides rather than absolute measurement of the sides of a triangle. This concept is central to right triangle trigonometry: the ratio of a given pair of sides is always the same for a given angle in a right triangle, regardless of the absolute measurement of the sides.	Problems involving right triangle trigonometry and similar triangles can be generated around the school. Some examples include: a) height of a tree by using shadows b) height of a building using trigonometry (measurement of angle by simple gravity protractor). c) distance across a river (real or fictitious) using trigonometry or similar triangles.	329, 330 331, 332	305-307
2. Apply similar triangles to practical problems.				306-307
3. Define sine, cosine and tangent ratios for right angle triangles.			332, 334	308, 312
4. Find the trigonometric ratios of the acute angles in a right triangle when the sides are given.	example:  $\frac{AC}{AB} = \frac{DF}{DE} = \sin 20^\circ$	INDIRECT MEASUREMENT USING SIMILAR TRIANGLES	333-334	309-315
5. Determine the trigonometric ratios of any given acute angles.		1. Height of a tree		308-315
6. Determine the measure of any acute angle given one of its trigonometric ratios.	Outdoor measurement problems should be limited to simple right triangle problems. Instruments for distance and angle measurement can be made from very simple materials. See *Excursions in Outdoor Measurement* by D. Johnson (J. Weston Walch, Publishers). (Cont.)	 find by measuring BC DE EF Calculate AB $\Delta ABC \sim \Delta DEF$ why? (Cont.)	335-337 337	308-315
7. Solve problems based on right triangles using trigonometric ratios.			338-340	308-315

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES *Math Is 4*	PRIMARY REFERENCES *Holt Math 4*
G. Trigonometry (Cont.)	Students should become familiar with trigonometric tables and how to use them but should be allowed to use the calculator.	2. Distance across a river  find by measuring BC DC DE Calculate AB Points D and C and B are collinear. D and C are arbitrarily chosen. Choose point E so that E, C and A are in a line.		
H. Geometry 1. Recognize and use the following terms: vertex, side(ray), degree, straight angle, right angle, acute angle, obtuse angle, reflex angle, adjacent angle, complementary angle and supplementary angle.	Using diagrams, the students should be able to describe each of these terms. To most students this is a review section.		264, 266	209-212

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES	
			Math Is 4	*Holt Math 4*
H. Geometry (Cont.)				
2. Recognize and use the following terms associated with triangles: equilateral, equiangular, isosceles, scalene and right triangles; hypotenuse.	Where applicable, measurements could be assigned to different types of triangles and polygons so that perimeters and areas can also be calculated.		265, 267	210
3. Use the Pythagoras theorem to solve right triangles and associated problems.		If a 2000 metre railway track expands 2 metres, how high will the track rise, assuming the ends are fixed? 	37-42, 313, 315	308-315
4. Recognize and use the following terms associated with polygons: quadrilateral, trapezoid, parallelogram, rectangle, rhombus, square, regular polygon, and diagonal.			261, 265 312, 313	210, 211
5. Recognize and use the following terms associated with parallel lines: transversal, corresponding angles, alternate angles and interior angles.	Students should be encouraged to give examples of parallel lines in the world around us.	Building Construction: Doors and door frames, windows, etc.	296-299	223-226, 237-240

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES *Math Is 4*	PRIMARY REFERENCES *Holt Math 4*
H. Geometry (Cont.) 6. Recognize and use the following terms: congruency, similarity, perpendicular, bisector and perpendicular bisector.		Using parallel lines in the same plane (e.g., exercise book) have students draw transversals and discuss measurement of angles formed. Skew lines could be discussed.	264, 271-274, 367, 329-333	241-249, 214
7. Measure an angle with a protractor.		Use the face of a clock with the minute hand on 12 and various positions of the hour hand (guess measurement first).		209
8. Construct an angle congruent to a given angle.			255	213
9. Construct the bisector of a given angle.			255	213
10. Construct a perpendicular to a given line segment: a) at a given point on a segment b) through a point not on the same segment.			255	213, 214
11. Construct the right bisector of a segment.			255	214

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES	
			Math Is 4	*Holt Math 4*
H. Geometry (Cont.) 12. Construct a line parallel to a given line.			255	214
13. Recognize that a formal, axiomatic development requires: a) undefined terms b) definitions c) assumptions (postulates or axioms) d) theorems	In order to develop an orderly structure we must agree on the "rules of the game." After we have agreed to certain definitions and rules of procedure, we cannot change them; otherwise our discussion would be confusing. Different texts use different procedures and in order to be consistent as to order of presentation one basic text should be used.	Differentiate between inductive and deductive reasoning.	262-263	217 221-222 224 258-259
14. State, prove and apply these basic theorems of geometry: a) vertically opposite angle theorem b) congruence of triangles using SAS, ASA, SSS c) isosceles triangle theorem d) parallel line theorems e) the sum of the measure of the interior angles of a triangle is 180°.			270, 288 296-300, 301-304, 306	216-217 241-249 250-252 237-240 229-230
15. Apply the basic theorems to solve problems involving numerical application.			302-304	261-263

MATHEMATICS 13
PRIMARY
REFERENCE
CORRELATION

MATHEMATICS 13 - PRIMARY REFERENCE CORRELATION

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	PRIMARY REFERENCES MMW
A. Number Systems 1. Identify numbers as natural, whole, integral and rational.	Many students entering this program should have some knowledge of the number systems. However, several concepts will require both practice and maintenance to develop previously taught skills.	When working with these basic number concepts practical problems should be used as much as possible. Basic problem-solving shows the need for accurate calculations and applications. Application problems can also motivate the students to grasp these skills fully and also provide motivation to study further the irrational numbers and the real numbers.	39	47
2. Add, subtract, multiply and divide rational numbers.			41	2, 3, 51, 52
3. Convert a rational number from decimal form to fractional form $\frac{a}{b}$ and vice versa.			39-41	48-50
4. Apply percentage to consumer related problems. a) simple interest b) discounts and mark-ups c) commission	The role of the calculator can also be introduced in this section to help explore the number systems more fully.	Applications related to student interest such as stereo equipment and automobiles may be used.	173-177	53, 54, 339-351

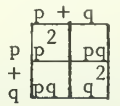
OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	MMW
B. Equations and Graphing				
1. Maintain skills in solving first degree equations with rational coefficients.	It is not necessary to include fractional equations with variables in the denominator.		116-120	182
2. Solve word problems whose solutions are based on first degree equations with rational coefficients.	Several practical problems exist in the sciences, business and technical fields that require the development of equations and their respective algebraic and graphical solutions. Problem solving approaches should be emphasized.		132-133	
3. Identify and use the terms: quadrant, origin, axis, coordinate, ordered pair, abscissa and ordinate.		Latitude and longitude; grid plans of cities and laying out of new townsites; telephone rates are based on a grid system; grid organization of an oil field.	84-86	123-126
4. Recognize and graph ordered pairs.	Game approaches, such as "Battleship" and picture plotting, can be used to reinforce graphing concepts. Computer games often involve grids and the plotting of points.		87-89	

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	PRIMARY REFERENCES MMW
C. Presentation of Data and Descriptive Statistics 1. Organize data by: a) collecting various types of data b) grouping data into classes c) determining the frequency of each class d) defining class width (interval), e) graphing data	As an extension to the graphing work previously done, students should be able to collect and organize data so that decisions, inferences, and predictions can be made. A knowledge of the basic concepts of statistics will stimulate problem solving with statistics. The various types of graphs to be used should include bar graphs, circle graphs and histograms.	Statistical applications involving the students themselves are plentiful. The heights of students to the nearest cm can be plotted in a histogram. Ideally at least 100 data items produce a presentable histogram, so the data from a number of classes of students of the same age may be pooled. This histogram may be bimodal due to the fact that males and females are grouped together. This bimodality illustrates the fact that we do not have a homogeneous group. By drawing two histograms, one for females and one for males, one most likely obtains a reasonable approximation to the normal curve.	21-25, 29-33	25-29, 36-40
2. Calculate the mean, median and mode for given data.			26-29	30-36
3. Select the most suitable of the three types of averages for a given set of data.		In the example of student heights, the mean is the most suitable average. Data with a few large values tend to distort the mean. Some personal income examples may be used to illustrate this distortion.	27-28	

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	PRIMARY REFERENCES MMW
C. Presentation of Data and Descriptive Statistics (Cont.) 4. Define the following terms: raw data, sample, population and measures of central tendency.		In the student example, the raw data is the individual student's height prior to grouping and displaying graphically. The students used are a sample from the population of all students of the same age. Other examples of data that can be handled similarly are: a) the odometer reading on the student's/parent's car b) the area of a student's home c) the number of pushups a student can do.	21-27	
D. Variation 1. Identify direct variation.	Review skills relating to graphing, the construction of tables and units of measurement.	In police work, it is important to know that the length of the humerus is directly proportional to the height of the corpse. H = 2.89 b + 70.6 (Male) H = 2.75 b + 71.4 (Female)	146-155	202-204
2. Identify inverse variation.		Boyles law relating pressure (P) and volume (V) could be developed to illustrate inverse variation.	156-158	204-207

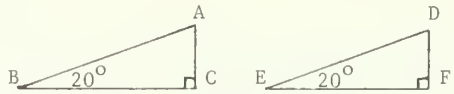
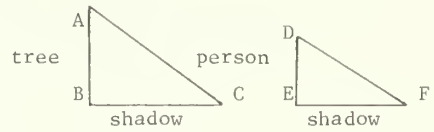
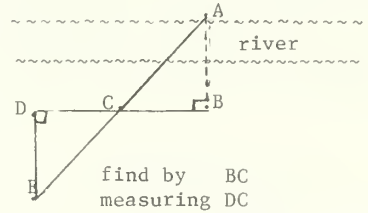
OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	PRIMARY REFERENCES MMW
D. Variation (Cont.) 3. Identify partial variation.			155-159	208-210
4. Solve problems based on direct, inverse and partial variation.	Have the students develop practical problems that are familiar to them, such as wage earnings, consumer problems and science problems.		160-163	206, 207, 209
5. Find the constant of proportionality for a given variation.	Variation problems involving variables other than the first degree are not recommended.		154	
E. Exponents and Radicals 1. Utilize the following laws of exponents: Where a, b, $\in$ I; x, y $\in$ R; $x \neq 0$, $y \neq 0$ $x^a \cdot x^b = x^{a+b}$ $x^a \div x^b = x^{a-b}$ $(x^a)^b = x^{ab}$ $(xy)^a = x^a y^a$ $\frac{x^a}{y} = \frac{x^a}{y^a}$ (Cont.)	The values of "a" and "b" should be specific integers while x and y should be monomials. Students should be able to recognize the parts of a power from an example. e.g., x^3: x^3 is the power x is the base 3 is the exponent Every attempt should be made to help students understand the reasons why these laws exist. Demonstrate that: $(2)^2 \cdot (2)^3 = (2 \cdot 2) \cdot (2 \cdot 2 \cdot 2) = 2^5$ (Cont.)		58, 59, 61	11-18

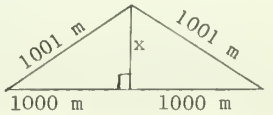
OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	PRIMARY REFERENCES MMW
E. Exponents and Radicals (Cont.) $x^0 = 1$ $x^{-a} = \frac{1}{x^a}$	and then short cut to the law $(2)^2 \cdot (2)^3 = 2^{2+3} = 2^5$			
2. Change a number from decimal form to scientific (standard) notation and vice-versa.	This may be a good time to review metric units.		14, 19	19-20
3. Perform the operations of multiplication and division on numerals expressed in scientific (standard) notation.		Various science problems can be used to illustrate the use of large and small numbers in standard form.	18	21-22
F. Polynomials 1. Know and be able to use the following terms: a) algebraic expression b) term c) factor d) monomial e) binomial f) trinomial g) polynomial h) coefficient i) degree	Like and unlike terms should be clearly explained. Considerable time should be spent here on the language of mathematics. Order of operation should also be reviewed. Stress the difference between term and factor.		63, 66, 74	77-79

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	PRIMARY REFERENCES MMW
F. Polynomials (Cont.) 2. Evaluate a polynomial for given values of the variables.		Substitute values for the variables in some of the more common formulae used in science such as area, volume and measurement. This can be related to area and volume of hot dogs, cylinders, hamburgers and other items.	62, 63	
3. Add and subtract polynomials.			64, 65	78, 80, 83
4. Multiply: a) monomial x monomial b) monomial x binomial c) monomial x trinomial d) binomial x binomial	Numerical examples $[(6 + 2)(6 - 3)]$ can be used to introduce algebraic multiplication of $(x + 2)(x - 3)$.		64-67	78-88
5. Write the expansions of $(P + Q)^2$, $(P - Q)^2$ and $(P - Q)(P + Q)$ and recognize them as general cases.	Diagrammatic illustrations of $(p + q)^2$ can be presented.  	Show the biological implications in heredity such as a pea having a dominant wrinkled gene (W) and a recessive smooth gene (w) crossed with same (W + w). $(W + w)(W + w) = W^2 + 2Ww + w^2$ W^2: Dominant wrinkled pea $2Ww$: two heterogeneous wrinkled peas w^2: recessive smooth pea	74, 75	85-88

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES: AMT	PRIMARY REFERENCES: MMW
F. Polynomials (Cont.) 6. Recognize and factor a polynomial with a common factor where the common factor may be: a) a monomial b) a binomial			72, 73	
7. Factor a trinomial of the form: $ax^2 + bx + c$: a, b, c, $\in$ I.			76, 77	89-96
8. Factor polynomials of the form: $P^2 - Q^2$	Have students experiment inductively with questions of this type before teaching a specific method of factoring. RESTRICT P and Q to monomials.		75, 76	89-96
9. Factor polynomials by using any combination of methods outlined in objectives 6 through 8.		Introduce problems requiring factoring. Example: A quadrilateral which has a length of 2 metres longer than its width is to have its area increased by one square metre. What are the dimensions of the new quadrilateral?	78, 79	96
10. Divide a polynomial by a: a) monomial b) binomial	Division of polynomials should be restricted to first degree binomials with a single variable.		68-72	89-105
11. Simplify rational expressions by factoring.	Review numerical rational number operations before proceeding with the (Cont.)		73, 76	

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	PRIMARY REFERENCES MMW
F. Polynomials (Cont.)	rational algebraic number operations. Do not include rational expressions of the form: $\frac{a - b}{b - a}$			
12. Perform the operation of multiplication and division with rational expressions.			130	
13. Perform the operations of addition and subtraction of rational expression with: a) the same denominator b) different denominators	Denominators should be restricted to either binomials not requiring factoring or monomials. $\frac{3}{x^2} - \frac{5x}{3xy}$ or $\frac{x}{x + 2} - \frac{5}{x - 1}$		116, 117	
G. Trigonometry 1. Find the unknown sides in similar triangles. 2. Apply similar triangles to practical problems. 3. Define sine, cosine and tangent ratios for right angle triangles. (Cont.)	It is worth introducing trigonometry by using similar triangles since this gives students practice in thinking in terms of ratios of sides rather than absolute measurement of the sides of a triangle. This concept is central to right triangle trigonometry: the ratio of a given pair of sides is always the same for a given angle in a right triangle, regardless of the absolute (Cont.)	Problems involving right triangle trigonometry and similar triangles can be generated around the school. Some examples include: a) height of a flagpole by using shadows b) height of a building using trigonometry (measurement of angle by simple gravity protractor) (Cont.)	228, 229 231 230, 235, 244, 245	246-249

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	PRIMARY REFERENCES MMW
G. Trigonometry (Cont.)				
4. Find the trigonometric ratios of the acute angles in a right triangle when the sides are given.	measurement of the sides.	c) distance across a river (real or fictitious) using either trigonometry or similar triangles.	236, 237	247-249
5. Determine the trigonometric ratios of any given acute angle.	example:  $\frac{AC}{AB} = \frac{DF}{DE} = \sin 20^{\circ}$.	INDIRECT MEASUREMENT USING SIMILAR TRIANGLES	238, 239	250-252
6. Determine the measure of any acute angle given one of its trigonometric ratios.		1. Height of a tree  find by measuring BC DC DE Calculate AB	238	251-253
7. Solve problems based on right triangles using trigonometric ratios.	Outdoor measurement problems should be limited to simple right triangle problems. Instruments for distance and angle measurement can be made from very simple materials. See *Excursions in Outdoor Measurement* by D. Johnson. (J. Weston Walch, Publishers). Care should be taken in assigning multi-step problems and 3-dimensional problems as the Mathematics 13 students may have some trouble with these. Students should become familiar with trigonometric tables and how to use them but should be allowed to use the calculator.	$\Delta ABC \sim \Delta DEF$ why?	240, 243, 246, 247	254-259
		2. Distance across a river pick a point or mark with a stake  find by measuring BC DC DE Calculate AB (Cont.)		

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	MMW
G. Trigonometry (Cont.)		Point D, C and B are collinear. D and C are arbitrarily chosen. Choose point E so that E, C and A are in a line.		
H. Geometry 1. Recognize and use the following terms: vertex, side (ray), degree, straight angle, right angle, acute angle, obtuse angle, reflex angle, adjacent angles, complementary angles, supplementary angles.	Using diagrams, the students should be able to describe each of these terms. To most students this is a review section.		199, 209, 220, 237	
2. Recognize and use the following terms associated with triangles: equilateral, equiangular, isosceles, scalene and right triangles.	Where applicable, measurements could be assigned to different types of triangles and polygons so that perimeters and areas can also be calculated.		200, 201, 230	214-217
3. Use the Pythagoras theorem to solve right triangles and associated problems.		If a 2000 metre railways track expands 2 metres, how high will the track rise.  	210-212, 223	217-219

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	PRIMARY REFERENCES MMW
H. Geometry (Cont.) 4. Recognize and use the following terms associated with polygons: quadrilateral, trapezoid, parallelogram, rectangle, rhombus, square, regular polygon and diagonal.			200, 203, 214, 216	
5. Recognize and use the following terms associated with parallel lines: transversal, corresponding angles, alternate angles and interior angles.	Students should be encouraged to give examples of parallel lines in the world around us.	Building Construction: Door and door frames, windows, etc.	204-206	
6. Recognize and use the following terms: congruency, similarity, perpendicular, bisector and perpendicular bisector.		Using parallel lines in the same plane (e.g., exercise book) have students draw transversals and discuss measurement of angles formed. Skew lines could be discussed.	226	224
7. Measure an angle with a protractor.		Use the face of a clock with the minute hand on 12 and various positions of the hour hand. (Guess measurement first)	199	
8. Construct an angle congruent to a given angle.	The mira may be used as an alternate to ruler and compass constructions.		249	

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	PRIMARY REFERENCES MMW
H. Geometry (Cont.) 9. Construct the bisector of a given angle.			248	
10. Construct a perpendicular to a given line segment: a) at a point on a segment b) through a point not on the same segment.			248	
11. Construct the right bisector of a line segment.			248	
12. Construct a line parallel to a given line.			249	219
16. Solve problems related to vertically opposite angles.			208, 209	
17. State and apply the conditions for congruence of triangles - SAS, SSS, ASA.			202	
18. State the conditions for similarity and solve related problems.			203, 204	

OBJECTIVES	COMMENTS	APPLICATIONS	PRIMARY REFERENCES AMT	PRIMARY REFERENCES MMW
H. Geometry (Cont.) 19. State the conditions for parallelism and apply to solving related problems.			204, 207	219-221
20. State and apply area formulas for triangles, rectangles, squares, parallelograms and trapezoids.			214-127	
21. Solve problems involving numerical applications of the relationships and conditions described in objectives 16-20.			222, 223 225, 229	

APPENDICES

APPENDIX A
OBJECTIVES OF THE GRADE 9 COURSE

1. NUMBER SYSTEMS
A. Whole Numbers
1. Writes the values for powers (whole number exponents).
2. Understands and uses the following properties: a. $(a^x)^y = a^{xy}$ b. $a^{-x} = \frac{1}{a^x}$ c. $a^o = 1,\ a \neq 0$
3. Maintains previously developed skills in problem solving.
4. Expresses a number as a product of factors (including prime factorization).
B. Integers
1. Maintains previously developed skills.
2. Simplifies expressions involving the order of operations (four arithmetic operations and powers).
C. Rationals
1. Maintains previously developed skills.
2. Writes any number in scientific notation and vice-versa.
3. Recognizes a need for negative rationals.
4. Writes positive or negative rationals in lowest terms or high terms.

5. Adds, subtracts, multiplies and divides positive or negative rational numbers.
6. Changes positive or negative rationals in the form $\frac{a}{b}$, $b \neq 0$ to decimals.
7. Changes rational numbers in decimal form to the form $\frac{a}{b}$.
8. Solves problems involving positive and/or negative rationals (emphasis on decimals).
9. Estimates products and quotients to determine if an answer is reasonable.
10. Estimates square roots of numbers.
11. Uses tables to determine the square root of a number.
2. RATIO AND PROPORTION
1. Maintains previously developed skills.
2. Uses ratios to solve probems involving: a. percentages b. distance, speed and time c. profit, interest, commission, tax, discount, premiums.
3. Uses ratios to construct scale drawings.
3. MEASUREMENT
1. Demonstrates that previous skills are maintained.
2. Calculates surface areas (SI units) of prisms and cylinders using formulas.
3. Calculates the area of regular polygons.

4. GEOMETRY
1. Demonstrates that previous skills are being maintained.
2. Demonstrates knowledge of the Theorem of Pythagoras through an ability to solve problems.
3. Using compass and straight edge, constructs triangles congruent to given triangles, using SSS, SAS, ASA.
4. Constructs regular polygons.
5. Uses such terms as edges, faces, lateral face, base, height, slant height, in examining prisms, pyramids and other polyhedra.
6. Classifies right prisms, right pyramids or regular polyhedra as specified by teacher.
7. Constructs models of right prisms, right pyramids or regular polyhedra as specified by teacher.
8. Develops, with assistance, formulas to measure volume and surface area of right prisms and cylinders.
9. Given word problems or diagrams and formulas, the student will solve volume and surface area problems.
5. GRAPHING
1. Makes graphs from mathematical data and recognizes the dependent variable and the relation constant (limited to linear relations).
2. Pictures square roots of numbers graphically and reads approximate roots of non-perfect squares from the graph.
6. ALGEBRA
1. Solves any first degree equation in one variable with rational coefficients.

Algebra (Continued)
2. Writes word problems for given mathematical statements.
3. Solves a variety of problems by writing an equation in one variable and solving same.
4. Knows that letters represent variables.
5. Knows that formulas represent rules or definitions that express a relation between variables in mathematics and/or science.
6. Interprets mathematical data and can express it as a relationship (limited to linear relations using a non-formal approach).
7. Applies mathematical principles of variation and formulas to real situations.
8. Predicts the effect of altering specific elements of a formula.
9. Solves problems which require the use of a formula.
10. Identifies specific algebraic terminology; constants, variables, terms and factors in an expression.
11. Evaluates expressions by performing the operations in correct order.
12. Classifies polynomials as to monomial, binomial and trinomial.
13. States the degree of a polynomial and writes the polynomial in standard form.
14. Translates English expressions into algebraic expressions.
15. Identifies the numerical coefficient of a monomial.
16. Identifies "like" and "unlike" terms and is able to combine like terms.

Algebra (Continued)
17. Finds the sum and difference of polynomials by re-ordering the elements.
18. Finds the products and quotients of monomials.
19. Finds the product of a monomial and a polynomial.
20. Factors a polynomial by taking out the greatest common factor.
21. Finds the product of binomials.
22. Factors trinomials $ax^2 + bx + c$, where $a = 1$.

APPENDIX B

ADDITIONAL COMMENTS

Alberta Education would welcome any comments and suggestions pertaining to the Grade 10 Interim Curriculum Guide. Please contact or forward comments to the Regional Office Mathematics Consultant in your area.